ADST/TR 94-003257

ADST ARWA
VISUAL SYSTEM MODULE
INTERFACE DESIGN DOCUMENT

Loral Advanced Distributed Simulation
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Date : 01-MAR-1994

Contract No. N61339-91-D-0001
Delivery Order No. 0048
CDRL A005

Prepared for

Simulation Training and Instrumentation Command
12350 Research Parkway
Orlando, FL 32826-3275

LORAL
Advanced Distributed Simulation

REPORT DOCUMENTATION PAGE

Form approved OMB No. 0704-0

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	28 February 1994	Version 1

4. TITLE AND SUBTITLE
ADST ARWA Visual System Module Interface Design Document

5. FUNDING NUMBERS
Contract No. N61339-91
Delivery Order Number 00
CDRL Number A005

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Loral Systems Company
ADST Program Office
12151-A Research Parkway
Orlando, FL 32826

8. PERFORMING ORGANIZATION REPORT NUMBER
ADST/WDL/TR-94-0032

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Simulation, Training and Instrumentation Command
STRICOM
Naval Training Systems Center
12350 Research Parkway
Orlando, FL 32826-3275

10. SPONSORING ORGANIZATION REPORT NUMBER
A005

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT (Maximum 200 words)
The ADST ARWA Visual System Module Interface Design Document describes the detailed design CSCI interfaces. This IDD outlines the interfaces between the VSC and various hardware items co the VSM, as well as interfaces between the VSM and the SSM and FSM CSCIs.

14. SUBJECT TERMS

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	17. SECURITY CLASSIFICATION OF THIS PAGE	17. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std Z39-18
298-102

LIST OF FIGURES

1 SCOPE

The scope of this Interface Design Document (IDD) is discussed in the following subparagraphs 1.1, 1.2, and 1.3.

1.1 Identification

This document applies to the Advanced Rotary Wing Aircraft (ARWA) Visual System Module (VSM) Computer Software Configuration Item (CSCI).

1.2 System Overview

The principal purpose of the Visual System Module is to simulate out-the-window and sensor imagery and to display the imagery to the crew members of an ARWA device. The interfaces described in this document allow the Visual System Controller (VSC) to communicate with hardware devices co-located within the VSM such as the Computer Image Generator (CIG), the out-the-window displays, the head tracker, the helmet mounted display, the maintenance joystick, the administrative console, and the Fiber Distributed Data Interface (FDDI) global bus, which allows communication to the Flight Station Module (FSM) CSCI and the Simulator System Module (SSM) CSCI.

1.3 Document Overview

The purpose of this document is to describe the detailed design of the Advanced Rotary Wing Aircraft Visual System Module CSCI interfaces. This Interface Design Document outlines the interfaces between the Visual System Controller and various hardware items co-located in the VSM, as well as interfaces between the VSM and the SSM and the FSM CSCIs.

Section 1 outlines the scope of the document.

Section 2 describes the documents referenced in this specification.

Section 3 outlines the interface design overview.

Section 4 provides general design notes.

2 REFERENCED DOCUMENTS

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

Non-Government

ANSI X3T9.5

Vendor Supplied Console Interface Control Document

Vendor Supplied Joystick Interface Control Document

Vendor Supplied Helmet Mounted Display Interface Control Document

Vendor Supplied Out-The-Window Display Interface Control Document

901182-775AA Rotary Wing Aircraft Simulation System ESIG-2000 Image Generator Interface Control Document. May 28, 1992.

3 INTERFACE DESIGN

The interface design is discussed in the following subparagraphs.

3.1 Interface Diagrams

The Visual System Controller is the software portion of the Visule System Module which interfaces with external hardware components related to the visual system. The VSC also interfaces with the Simulator System Module and the Flight System Module CSCIs through the FDDI Global Bus. A list of interfaces between the VSC and these components is summarized as follows:

Identifer: HT_To_VSC
Name: Head Tracker to VSC
Description: Head tracker position and status information

Identifer: VSC_To_HT
Name: VSC to Head Tracker
Description: Initialization and setup commands

Identifer: HMD_To_VSC
Name: Helmet Mounted Display to VSC
Description: Helmet Mounted Display status information

Identifer: VSC_To_HMD
Name: VSC to Helmet Mounted Display
Description: Initialization and setup commands

Identifer: Joystick_To_VSC
Name: Joystick to VSC
Description: Joystick position and status information

Identifer: VSC_To_Joystick
Name: VSC to Joystick
Description: Initialization and setup commands

Identifer: CIG_To_VSC
Name: Computer Image Generator to VSC
Description: Computer Image Generator status information

Identifer: VSC_To_CIG
Name: VSC to Computer Image Generator
Description: Initialization and control commands

Identifer: Console_To_VSC
Name: Administrative Console to VSC
Description: Administrative Console status and keyboard information

Identifer: VSC_To_Console
Name: VSC to Administrative Console
Description: Screen initialization and control commands

Identifer: FDDI_Global_Bus_To_VSC
Name: FDDI Global Bus to VSC
Description: FDDI Global Bus status and network information obtained from the SSM and FSM

Identifer: VSC_To_FDDI_Global_Bus
Name: VSC to FDDI Global Bus
Description: Network information and status destined for the SSM and FSM

Identifer: OTW_Displays_To_VSC
Name: Out-The-Window Displays to VSC
Description: Out-The-Window Displays status information

Identifer: VSC_To_OTW_Displays
Name: VSC to Out-The-Window Displays
Description: Status request

The following figure depicts the Context Diagram of the Visual System Controller, including external entities and external interfaces.

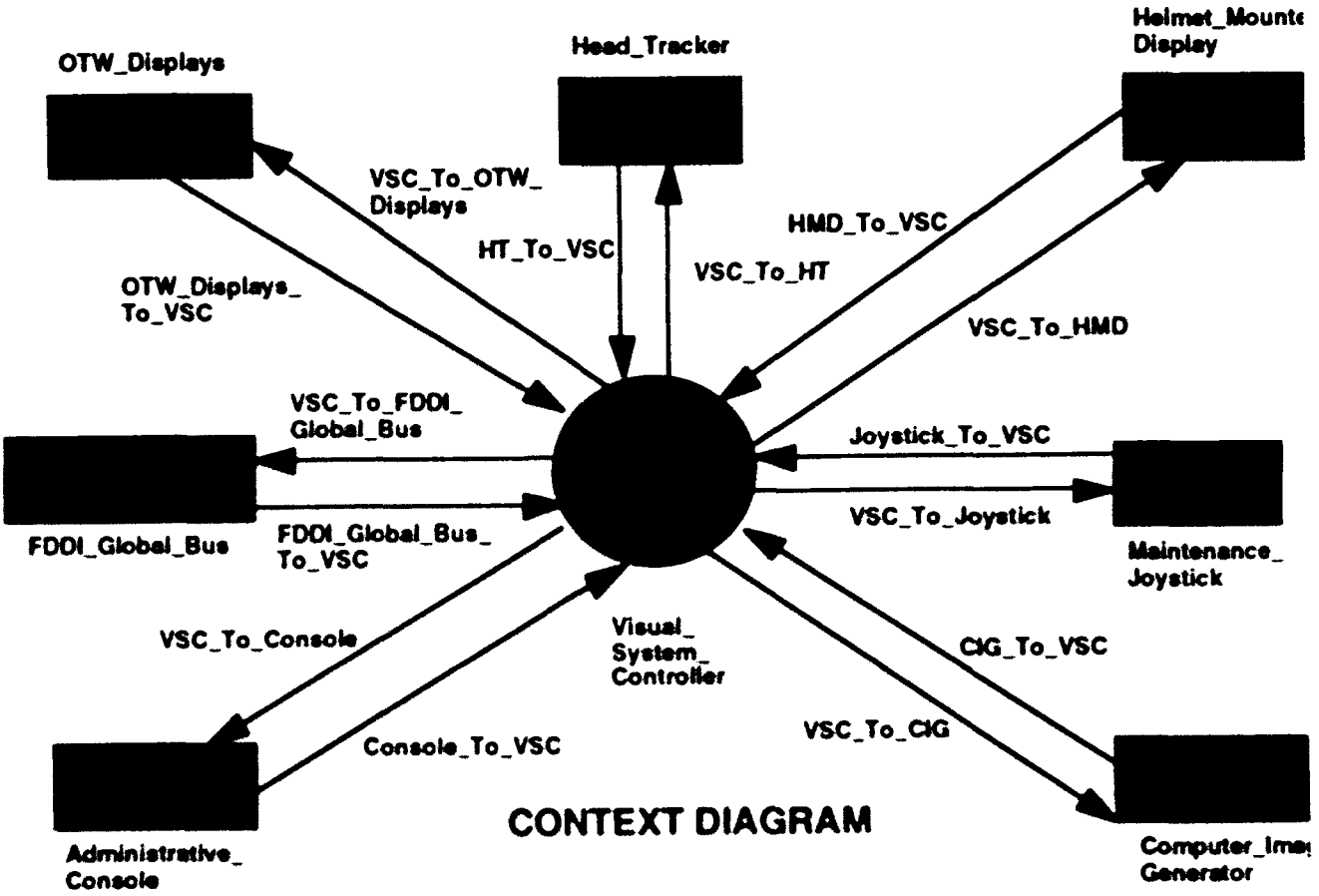

Figure 1. VSC, dfd Context-Diagram

3.2 Joystick To VSC

Identifier: Joystick_To_VSC
Name: Joystick to VSC
Description: Joystick position and status information
Source: Maintenance_Joystick
Destination: Visual_System_Controller

The following subparagraphs describe the Joystick_To_VSC interface.

3.2.1 Joystick To VSC Data Elements

Reference the vendor supplied interface control document for the joystick for information regarding Joystick_To_VSC data.

3.2.2 Joystick To VSC Message Descriptions

Joystick_To_VSC Hierarchy

Joystick_To_VSC Interface

Joystick_Position_Message Message

Joystick_X_Data Data Element
Joystick_Y_Data Data Element
Joystick_Fire_Button_Data Data Element

Joystick_Status_Message Message

Joystick_Status_Result_Data Data Element

3.2.3 Joystick To VSC Interface Priority

Priority for this interface is: HIGH

3.2.4 Joystick To VSC Communications Protocol

The following subparagraph describes the communications protocol for the Joystick_To_VSC interface

3.2.4.1 Joystick To VSC Protocol Name

Protocol Name: RS-232

The Joystick_To_VSC interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.3 VSC To Console

Identifier: VSC_To_Console
Name: VSC To Administrative Console
Description: Screen initialization and control commands
Source: Visual_System_Controller
Destination: Administrative_Console

The following subparagraphs describe the VSC_To_Console interface.

3.3.1 VSC To Console Data Elements

Reference the vendor supplied interface control document for the console for information regarding VSC_To_Console data.

3.3.2 VSC To Console Message Descriptions

VSC_To_Console Hierarchy

VSC_To_Console Interface

Console_Display_Data_Message Message

Console_Display_Data_Command_Data Data Element

Console_Status_Request_Message Message

Console_Status_Request_Command_Data Data Element

3.3.3 VSC To Console Interface Priority

Priority for this interface is: LOW

3.3.4 VSC To Console Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_Console interface.

3.3.4.1 VSC To Console Protocol Name

Protocol Name: RS-232

The VSC_To_Console interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.4 HT To VSC

Identifier: HT_To_VSC
Name: Head Tracker to VSC
Description: Head tracker position and status information
Source: Head_Tracker
Destination: Visual_System_Controller

The following subparagraphs describe the HT_To_VSC interface.

3.4.1 HT To VSC Data Elements

Reference the vendor supplied interface control document for the head tracker for information regarding HT_To_VSC data.

3.4.2 HT To VSC Message Descriptions

HT_To_VSC Hierarchy

HT_To_VSC Interface

HT_Position_Message Message

HT_Roll_Data Data Element
HT_Pitch_Data Data Element
HT_Yaw_Data Data Element
HT_X_Data Data Element
HT_Y_Data Data Element
HT_Z_Data Data Element

HT_Status_Message Message

HT_Status_Result_Data Data Element

3.4.3 HT To VSC Interface Priority

Priority for this interface is: HIGH

3.4.4 HT To VSC Communications Protocol

The following subparagraph describes the communications protocol for the HT_To_VSC interface.

3.4.4.1 HT To VSC Protocol Name

Protocol Name: RS-232

The HT_To_VSC interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.5 Console To VSC

Identifier: Console_To_VSC
Name: Administrative Console to VSC
Description: Administrative Console status and keyboard information
Source: Administrative_Console
Destination: Visual_System_Controller

The following subparagraphs describe the Console_To_VSC interface.

3.5.1 Console To VSC Data Elements

Reference the vendor supplied interface control document for the console for information regarding Console_To_VSC data.

3.5.2 Console To VSC Message Descriptions

Console_To_VSC Hierarchy

Console_To_VSC Interface

Console_Keyboard_Data_Message Message

Console_Keyboard_Data Data Element

Console_Status_Message Message

Console_Status_Result_Data Data Element

3.5.3 Console To VSC Interface Priority

Priority for this interface is: LOW

3.5.4 Console To VSC Communications Protocol

The following subparagraph describes the communications protocol for the Console_To_VSC interface.

3.5.4.1 Console To VSC Protocol Name

Protocol Name: RS-232

The Console_To_VSC interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.6 VSC To HT

Identifier: VSC_To_HT
Name: VSC to Head Tracker
Description: Initialization and setup commands
Source: Visual_System_Controller
Destination: Head_Tracker

The following subparagraphs describe the VSC_To_HT interface.

3.6.1 VSC To HT Data Elements

Reference the vendor supplied interface control document for the head tracker for information regarding VSC_To_HT data.

3.6.2 VSC To HT Message Descriptions

VSC_To_HT Hierarchy

VSC_To_HT Interface

HT_Initialization_Message Message

HT_Initialization_Command_Data Data Element

HT_Status_Request_Message Message

HT_Status_Request_Command_Data Data Element

3.6.3 VSC To HT Interface Priority

Priority for this interface is: LOW

3.6.4 VSC To HT Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_HT interface.

3.6.4.1 VSC To HT Protocol Name

Protocol Name: RS-232

The VSC_To_HT interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.7 VSC To Joystick

Identifier: VSC_To_Joystick
Name: VSC to Joystick
Description: Initialization and setup commands
Source: Visual_System_Controller
Destination: Maintenance_Joystick

The following subparagraphs describe the VSC_To_Joystick interface.

3.7.1 VSC To Joystick Data Elements

Reference the vendor supplied interface control document for the joystick for information regarding VSC_To_Joystick data.

3.7.2 VSC To Joystick Message Descriptions

VSC_To_Joystick Hierarchy

VSC_To_Joystick Interface

Joystick_Initialization_Message Message

Joystick_Initialization_Command_Data Data Element

Joystick_Status_Request_Message Message

Joystick_Status_Request_Command_Data Data Element

3.7.3 VSC To Joystick Interface Priority

Priority for this interface is: LOW

3.7.4 VSC To Joystick Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_Joystick interface.

3.7.4.1 VSC To Joystick Protocol Name

Protocol Name: RS-232

The VSC_To_Joystick interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.8 OTW Displays To VSC

Identifier: OTW_Displays_To_VSC
Name: Out-The-Window Displays to VSC
Description: Out-The-Window Displays status information
Source: OTW_Displays
Destination: Visual_System_Controller

The following subparagraphs describe the OTW_Displays_TO_VSC interface.

3.8.1 OTW Displays To VSC Data Elements

Reference the vendor supplied interface control document for the Out-The-Window display for information regarding OTW_Displays_To_VSC data.

3.8.2 OTW Displays To VSC Message Descriptions

OTW_Displays_To_VSC Hierarchy

OTW_Displays_To_VSC Interface

OTW_Status_Message Message

OTW_Status_Result_Data Data Element

3.8.3 OTW Displays To VSC Interface Priority

Priority for this interface is: LOW

3.8.4 OTW Displays To VSC Communications Protocol

The following subparagraph describes the communications protocol for the OTW_Displays_To_VSC interface.

3.8.4.1 OTW Displays To VSC Protocol Name

Protocol Name: RS-232

The OTW_Displays_To_VSC interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.9 CIG To VSC

Identifier: CIG_To_VSC
Name: Computer Image Generator to VSC
Description: Computer Image Generator status information
Source: Computer_Image_Generator
Destination: Visual_System_Controller

The following subparagraphs describe the CIG_To_VSC interface.

3.9.1 CIG To VSC Data Elements

Reference Rotary Wing Aircraft Simulation System ESIG-2000 Image Generator Interface Control Document (901182-775AA) for information regarding CIG_To_VSC data.

3.9.2 CIG To VSC Message Descriptions

CIG_To_VSC Hierarchy

CIG_To_VSC Interface

CIG_Status_Message Message

CIG_Status_Result_Data Data Element

3.9.3 CIG To VSC Interface Priority

Priority for this interface is: HIGH

3.9.4 CIG To VSC Communications Protocol

The following subparagraph describes the communications protocol for the CIG_To_VSC interface.

3.9.4.1 CIG To VSC Protocol Name

Protocol Name: ScramNet Reflective Memory

The CIG_To_VSC interface utilizes ScramNet reflective memory. The ScramNet Network is a replicated, shared-memory network designed for real-time, multiple-computer applications. With the ScramNet Network, each computer on the network has its own local copy of shared memory which is updated over a high- speed, serial-ring network. The ScramNet Network is unlike most networks because it is designed specifically for real- time applications. It requires no separate software driver to pass information. It can automatically filter out redundant data and uses an optimized ring network protocol.

The ScramNet Network consists of a motherboard and one daughterboard. The logic is a mixture of various families of integrated circuits. Programmable logic is used to reduce size, improve performance, reduce the number of connections and allow for future enhancements. The motherboard contains the shared memory, interrupt logic and the host adapter logic. Dip-switches on the motherboard select the base addresses for the control and status registers and the shared memory. The daughter board contains the network control logic and the receiver and transmitter logic.

Cabinet Kits contain the ScramNet Network receiver/transmitter connectors to the network, the light emitting diode (LED) node status indicators and the bank of dip-switches for configuring the node identification. These features are not present on the daughter board used in conjunction with the cabinet kit.

The ScramNet Network is a state-of-the-art network which embodies the following features:

- A ring topology with 150 million bits/second line transmission rate.

- 82-bit long message slots that pass over 1.8 million 32-bit words/sec among processors.

- "Data-Filter" implementation, such that only a memory word that has changed is passed to the network for communications to the other processors.

- Options for 128 Kilobyes (K), 512K, 1 Megabyte (M) or 2M bytes of replicated, shared memory for each computer (dip-switch assignable in the host memory address space).

- 256 node capacity on each ring.

- Dual fiber optic transmission media.

- No operating or system software required to support network protocol, except when using hardware interrupt capabilities.

- No network-dependent application software required.

- 247 nanosecond minimum node delay for each node on the ring.

- 794 nanosecond maximum node delay for each node on the ring.

- Automatic integer format conversion for one, two and four byte integers. This allows host processors with non- compatible integer formats to efficiently communicate via a shared memory interface.

- Up to 1000 feet separation between nodes.

3.10 FDDI Global Bus To VSC

Identifier: FDDI_Global_Bus_To_VSC
Name: FDDI Global Bus to VSC
Description: Network information and staus destined for the SSM and FSM
Source: FDDI_Global_Bus
Destination: Visual_System_Controller

The following subparagraphs describe the FDDI_Global_Bus_To_VSC interface.

3.10.1 FDDI Global Bus To VSC Data Elements

Reference Appendix A for a complete listing of the Visual System Module Data Dictionary. The Data Dictionary includes interface message descriptions and data elements for the FDDI_Global_Bus_To_VSC interface.

3.10.2 FDDI Global Bus To VSC Message Descriptions

FDDI_Global_Bus_To_VSC Hierarchy

FDDI_Global_Bus_To_VSC Interface

FDDI_Global_Bus_Input_Data_Message Message

FDDI_Global_Bus_Input_Data Data Element

3.10.3 FDDI Global Bus To VSC Interface Priority

Priority for this interface is: HIGH

3.10.4 FDDI Global Bus To VSC Communications Protocol

The following subparagraph describes the communications protocol for the FDDI_Global_Bus_To_VSC interface.

3.10.4.1 FDDI Global Bus To VSC Protocol Name

Protocol Name: Transmission Control Protocol / Internet Protocol (TCP/IP)

The FDDI_Global_Bus_To_VSC interface utilitzes a TCP/IP protocol over an FDDI network.

FDDI Overview

Standard: American National Standards Institute (ANSI) X3T9.5
Max. number of terminals: 500
Max. data speed: 100 Megabytes per second (Mbps)
Max. effective data speed: 100 Mbps
Media supported: Fiber
Total network length: 100 kilometers
Max. distance between workstations: 2 kilometers
Access technology: Token
Network delay: Deterministic
Relative cost per workstation: High
Relative cost per bps: Low

3.11 HMD To VSC

Identifier: HMD_To_VSC
Name: Helmet Mounted Display to VSC
Description: Helmet Mounted Display status information
Source: Helmet_Mounted_Display
Destination: Visual_System_Controller

The following subparagraphs describe the HMD_To_VSC interface.

3.11.1 HMD To VSC Data Elements

Reference the vendor supplied interface control document for the helmet mounted display for information regarding HMD_To_VSC data.

3.11.2 HMD To VSC Message Descriptions

HMD_To_VSC Hierarchy

HMD_To_VSC Interface

HMD_Status_Message Message

HMD_Status_Result_Data Data Element

3.11.3 HMD To VSC Interface Priority

Priority for this interface is: LOW

3.11.4 HMD To VSC Communications Protocol

The following subparagraph describes the communications protocol for the HMD_To_VSC interface.

3.11.4.1 HMD To VSC Protocol Name

Protocol Name: RS-232

The HMD_To_VSC interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.12 VSC To HMD

Identifier: VSC_To_HMD
Name: VSC to Helmet Mounted Display
Description: Initialization and setup commands
Source: Visual_System_Controller
Destination: Helmet_Mounted_Display

The following subparagraphs describe the VSC_To_HMD interface.

3.12.1 VSC To HMD Data Elements

Reference the vendor supplied interface control document for the helmet mounted display for information regarding VSC_To_HMD data.

3.12.2 VSC To HMD Message Descriptions

VSC_To_HMD Hierarchy

VSC_To_HMD Interface

HMD_Status_Request_Message Message

HMD_Status_Request_Command_Data Data Element

3.12.3 VSC To HMD Interface Priority

Priority for this interface is: LOW

3.12.4 VSC To HMD Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_HMD interface.

3.12.4.1 VSC To HMD Protocol Name

Protocol Name: RS-232

The VSC_To_HMD interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

3.13 VSC To CIG

Identifier: VSC_To_CIG
Name: VSC to Computer Image Generator
Description: Initialization and control commands
Source: Visual_System_Controller
Destination: Computer_Image_Generator

The following subparagraphs describe the VSC_To_CIG interface.

3.13.1 VSC To CIG Data Elements

Reference Rotary Wing Aircraft Simulation System ESIG-2000 Image Generator Interface Control Document (901182-775AA) for information regarding VSC_To_CIG data.

3.13.2 VSC To CIG Message Descriptions

VSC_To_CIG Hierarchy

VSC_To_CIG Interface

CIG_Packet_Message Message

CIG_Packet_Command_Data Data Element

CIG_Status_Request_Message Message

CIG_Status_Request_Command_Data Data Element

3.13.3 VSC To CIG Interface Priority

Priority for this interface is: HIGH

3.13.4 VSC To CIG Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_CIG interface.

3.13.4.1 VSC To CIG Protocol Name

Protocol Name: ScramNet Reflective Memory

The VSC_To_CIG interface utilizes ScramNet reflective memory. The ScramNet Network is a replicated, shared-memory network designed for real-time, multiple-computer applications. With the ScramNet Network, each computer on the network has its own local copy of shared memory which is updated over a high- speed, serial-ring network. The ScramNet Network is unlike most networks because it is designed specifically for real- time applications. It requires no separate software driver to pass information. It can automatically filter out redundant data and uses an optimized ring network protocol.

The ScramNet Network consists of a motherboard and one daughterboard. The logic is a mixture of various families of integrated circuits. Programmable logic is used to reduce size, improve performance, reduce the number of connections and allow for future enhancements. The

motherboard contains the shared memory, interrupt logic and the host adapter logic. Dip-switches on the motherboar select the base addresses for the control and status registers and the shared memory. The daughter board contains the network control logic and the receiver and transmitter logic.

Cabinet Kits contain the ScramNet Network receiver/transmitter connectors to the network, the LED node status indicators and the bank of dip-switches for configuring the node identification. These features are not present on the daughter board used in conjunction with the cabinet kit.

The ScramNet Network is a state-of-the-art network which embodies the following features:

- A ring topology with 150 million bits/second line transmission rate.

- 82-bit long message slots that pass over 1.8 million 32-bit words/sec among processors.

- "Data-Filter" implementation, such that only a memory word that has changed is passed to the network for communications to the other processors.

- Options for 128K, 512K, 1M or 2M bytes of replicated, shared memory for each computer (dip-switch assignable in the host memory address space).

- 256 node capacity on each ring.

- Dual fiber optic transmission media.

- No operating or system software required to support network protocol, except when using hardware interrupt capabilities.

- No network-dependent application software required.

- 247 nanosecond minimum node delay for each node on the ring.

- 794 nanosecond maximum node delay for each node on the ring.

- Automatic integer format conversion for one, two and four byte integers. This allows host processors with non-compatible integer formats to efficiently communicate via a shared memory interface.

- Up to 1000 feet separation between nodes.

3.14 VSC To FDDI Global Bus

Identifier: VSC_To_FDDI_Global_Bus

Name: VSC to FDDI Global Bus
Description: Network information and status destined for the SSM and FSM
Source: Visual_System_Controller
Destination: FDDI_Global_Bus

The following subparagraphs describe the VSC_To_FDDI_Global_Bus interface.

3.14.1 VSC To FDDI Global Bus Data Elements

Reference Appendix A for a complete listing of the Visual System Module Data Dictionary. The Data Dictionary includes interface message descriptions and data elements for the VSC_To_FDDI_Global_Bus interface.

3.14.2 VSC To FDDI Global Bus Message Descriptions

VSC_To_FDDI_Global_Bus Hierarchy

VSC_To_FDDI_Global_Bus Interface

FDDI_Global_Bus_Output_Data_Message Message

FDDI_Global_Bus_Output_Data Data Element

3.14.3 VSC To FDDI Global Bus Interface Priority

Priority for this interface is: HIGH

3.14.4 VSC To FDDI Global Bus Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_FDDI_Global_Bus interface.

3.14.4.1 VSC To FDDI Global Bus Protocol Name

Protocol Name: TCP/IP

The VSC_To_FDDI_Global_Bus interface utilitzes a TCP/IP protocol over an FDDI network.

FDDI Overview

Standard: ANSI X3T9.5
Max. number of terminals: 500

Max. data speed: 100 Mbps
Max. effective data speed: 100 Mbps
Media supported: Fiber
Total network length: 100 kilometers
Max. distance between workstations: 2 kilometers
Access technology: Token
Network delay: Deterministic
Relative cost per workstation: High
Relative cost per bps: Low

3.15 VSC To OTW Displays

Identifier: VSC_To_OTW_Displays
Name: VSC to Out-The-Window Displays
Description: Status request
Source: Visual_System_Controller
Destination: OTW_Displays

The following subparagraphs describe the VSC_To_OTW_Displays interface.

3.15.1 VSC To OTW Displays Data Elements

Reference the vendor supplied interface control document for the Out-The-Window display for information regarding VSC_To_OTW_Displays data.

3.15.2 VSC To OTW Displays Message Descriptions

VSC_To_OTW_Displays Hierarchy

VSC_To_OTW_Displays Interface

OTW_Status_Request_Message Message

OTW_Status_Request_Command_Data Data Element

3.15.3 VSC To OTW Displays Interface Priority

Priority for this interface is: LOW

3.15.4 VSC To OTW Displays Communications Protocol

The following subparagraph describes the communications protocol for the VSC_To_OTW_Displays interface.

3.15.4.1 VSC To OTW Displays Protocol Name

Protocol Name: RS-232

The VSC_To_OTW_Displays interface uses standard RS-232 serial data transmission. Data is sent out in a stream, one bit at a time, over one channel. When the VSC is instructed to send or receive data, the data must pass through a serial interface to exit or enter as serial data.

4 NOTES

ACRONYM LIST

ARWA	Advanced Rotary Wing Aircraft
CIG	Computer Image Generator
CSCI	Computer Software Configuration Item
FDDI	Fiber Distributed Data Interface
FSM	Flight System Module
IDD	Interface Design Document
K	Kilobyte
LED	Light Emitting Diode
M	Megabyte
MBPS	Megabytes Per Second
SSM	Simulator System Module
TCPIP	Transmission *Communications* Protocol Interface Protocol
VSC	Visual System Controller
VSM	Visual System Module

5 APPENDIXES

APPENDIX A

DATA DICTIONARY LISTING:

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Acceleration (data flow) =
 Earth_Acceleration_Components.
Activity_Requested (data flow) =
 Task_Command.
Adjustable_Lighting (data flow) =
 ["Ambient_Illumination" | "Horizon_Brightness"].
Adjustment_Height (data flow) =
 Feet.
After_Burner (data flow) =
 "Boolean".
Air_To_Air_Target_Data (data flow) =
 Designated_Target_Location +
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 Designated_Target_Identification +
 Designated_Target_Motion +
 Designated_Target_Attitude +
 Designated_Target_Tracking.
Air_Vehicle_Appearance (data flow) =
 Air_Vehicle_Appearance_Array.
Air_Vehicle_Appearance_Array (data flow) =
 {Platform_Air_Domain_Entity_Appearance}.
Air_Vehicle_Dynamics_Half_Rate (data flow) =
 External_Entity_Dynamic_Data_Element +
 Air_Vehicle_Appearance.
Air_Vehicle_Dynamics_Half_Rate_Outputs (data flow) =
 Air_Vehicle_Dynamics_Half_Rate.
Air_Vehicle_Static_Data (data flow) =
 External_Entity_Static_Data_Element.
Air_Vehicle_Static_Outputs (data flow) =
 Air_Vehicle_Static_Data.
Altitude_Acceleration (data flow) =
 "Float".
Altitude_Position (data flow) =
 Feet.
Altitude_Velocity (data flow) =
 "Float".
Angular_Acceleration (data flow) =
 Angular_Acceleration_Components.
Angular_Acceleration_Components (data flow) =
 Roll_Acceleration +
 Pitch_Acceleration +
 Yaw_Acceleration.
Angular_Position_Components (data flow) =
 Roll_Angle + Pitch_Angle + Yaw_Angle.
Angular_Velocity (data flow) =
 Angular_Velocity_Components.
Angular_Velocity_Components (data flow) =
 Roll_Velocity +
 Pitch_Velocity +
 Yaw_Velocity.
Articulated_Part (data flow) =
 ["Tank_Turret" | "Helicopter_Rotor"].
Articulated_Part_Data (data flow) =
 Part + Part_Position.
Articulated_Parts_Damage (data flow) =
 Articulated_Part.
Articulation (data flow) =
 Articulated_Part_Data.
Attitude (data flow) =
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Angular_Position_Components.
Azimuth (data flow) =
Radians.
Burst (data flow) =
Burst_Descriptor_Type.
Burst_Descriptor_Type (data flow) =
Munition + Warhead + Fuze.
Category (data flow) =
"Integer".
Chaff_And_Flare_Dynamic_Data (data flow) =
External_Entity_Dynamic_Data_Record.
Chaff_And_Flares_Half_Rate (data flow) =
Chaff_And_Flare_Dynamic_Data.
Chaff_And_Flares_Sixteenth_Rate (data flow) =
Chaff_Unique_Data +
Flares_Unique_Data.
Chaff_Cloud_Density (data flow) =
"Float".
Chaff_Cloud_Radius (data flow) =
Feet.
Chaff_Cloud_Scope (data flow) =
"Float".
Chaff_Count (data flow) =
"Integer".
Chaff_Data (data flow) =
Chaff_External_Entity_Unique_Data_Array.
Chaff_Dynamics_Half_Rate (data flow) =
External_Entity_Dynamic_Data_Element.
Chaff_Dynamics_Half_Rate_Outputs (data flow) =
Chaff_Dynamics_Half_Rate.
Chaff_External_Entity_Unique_Data (data flow) =
ID + Chaff_Cloud_Radius + Chaff_Cloud_Density +
Chaff_Cloud_Scope + Chaff_Radar_Cross_Section +
Chaff_RF_Low_End + Chaff_RF_High_End +
Chaff_RCS_High_End.
Chaff_External_Entity_Unique_Data_Array (data flow) =
{Chaff_External_Entity_Unique_Data}.
Chaff_External_Entity_Unique_Data_Record (data flow) =
Number_Of_Chaffs_In_Array +
Chaff_Data.
Chaff_Radar_Cross_Section (data flow) =
Decibel.
Chaff_RCS_High_End (data flow) =
Decibel.
Chaff_RF_High_End (data flow) =
MHZ.

Chaff_RF_Low_End (data flow) =
MHZ.
Chaff_Unique_Data (data flow) =
Chaff_External_Entity_Unique_Data_Record.
Character_Set (data flow) =
Character_Set_List.
Character_Set_List (data flow) =
["ASCII_Character_Set" | "Other"].
CIG_Control (data flow) =
Sensor_Effects_Control +
Ownship_Control +
Environment_Effects_Control +
Visual_Channel_Control +
MM_Control +
CIG_DB_Control.
CIG_Database_Directives (data flow) =
"CIG_Database_Selection_Directives".
CIG_DB_Control (data flow) =
"CIG_DB_Control".
CIG_DB_Stat (data flow) =
"CIG_DB_Stat".
CIG_Description_Data (data flow) =
"CIG_Description_Data".
CIG_Directives (data flow) =
Visual_Channel_Directives +
Environment_Effects_Directives +
Special_Effects_Directives +
Moving_Model_Directives +
Ownship_Directives +
CIG_Database_Directives +
Initial_Scene_Content_Directives.
CIG_HW_Stat (data flow) =
"CIG_HW_Stat".
CIG_Stat (data flow) =
"CIG_Stat".
CIG_To_VSC (data flow) =
"CIG_To_VSC".
CLI_Commands (data flow) =
"CLI_Commands".
Clock_Tick (data flow) =
Clock_Ticks.
Clock_Tick_Message (data flow) =
Clock_Tick + Current_Simulation_Frame.
Clock_Tick_Message_Max_Rate (data flow) =
Clock_Tick_Message.
Clock_Ticks (data flow) =

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 "Integer".
Cloud_Adjustment (data flow) =
 ["Top" | "Bottom"].
Cloud_Level (data flow) =
 Cloud_Adjustment.
Cloud_Level_Adjustment (data flow) =
 Cloud_Level + Adjustment_Height.
Cloud_Level_Adjustment_Message (data flow) =
 Cloud_Level_Adjustment.
Collision_Data (data flow) =
 Current_Collision_Status +
 Collision_Kind +
 Collision_Point_ID +
 Collision_Point_Position +
 Collision_Velocity +
 Collision_Mass.
Collision_Data_Change (data flow) =
 Collision_Data.
Collision_Kind (data flow) =
 Collisions.
Collision_Mass (data flow) =
 Pounds.
Collision_Point (data flow) =
 ["Left_Landing_Gear" | "Right_Landing_Gear" |
 "Tail_Gear" | "Tail_Rotor" | "Nose" |
 "Left_Rotor_Tip" | "Right_Rotor_Tip" |
 "Front_Rotor_Tip"].
Collision_Point_ID (data flow) =
 Collision_Point.
Collision_Point_Position (data flow) =
 Earth_Position_Components.
Collision_Status (data flow) =
 ["Collision" | "No_Collision"].
Collision_Velocity (data flow) =
 Ft_Per_Min.
Collisions (data flow) =
 ["Terrain" | "External_Entity"].
Console_To_VSC (data flow) =
 "Console_To_VSC".
Control_Command (data flow) =
 Module_Mode_Change_Commands.
Control_Parameter (data flow) =
 Instuctor_Controllable_Parameter.
Control_Reply (data flow) =
 Module_Mode_Change_Responses.
Country (data flow) =
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Country_List.
Country_List (data flow) =
"Integer".
Current_Collision_Status (data flow) =
Collision_Status.
Current_Simulation_Frame (data flow) =
Simulation_Frames.
Damage_Location (data flow) =
Entity_Damage.
Damage_Location_1 (data flow) =
"Integer".
Damage_Location_2 (data flow) =
"Integer".
Damage_Severity (data flow) =
"Integer".
Data_Update_Rate (data flow) =
["Request_High" | "Allow_Low"].
Day (data flow) =
"Integer".
Decibel (data flow) =
"Float".
Designated_Target_Attitude (data flow) =
Angular_Position_Components.
Designated_Target_Identification (data flow) =
External_Entity_ID.
Designated_Target_Location (data flow) =
Earth_Position_Components.
Designated_Target_Motion (data flow) =
Earth_Velocity_Components.
Designated_Target_Tracking (data flow) =
"Boolean".
Desired_Load (data flow) =
Weapon_Station_Loading.
Destroyed (data flow) =
"Boolean".
Detonation_Data (data flow) =
Detonation_Location + Burst + Detonation_Velocity +
Loc_Entity + Results + Articulated_Parts_Damage.
Detonation_Location (data flow) =
Earth_Position_Components.
Detonation_Result (data flow) =
["Detonation" | "Impact" | "No_Result"].
Detonation_Velocity (data flow) =
Linear_Velocity_Components.
Discrete_State (data flow) =
["Off" | "On"].

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Display_Information (data flow) =
 "Display_Information".
Domain (data flow) =
 "Integer".
Downwash_Angle (data flow) =
 Radians.
Dust_Cloud (data flow) =
 "Integer".
Dynamic_Data (data flow) =
 External_Entity_Dynamic_Data_Array.
Earth_Acceleration_Components (data flow) =
 Latitude_Acceleration +
 Longitude_Acceleration +
 Altitude_Acceleration.
Earth_Position_Components (data flow) =
 Latitude_Position +
 Longitude_Position +
 Altitude_Position.
Earth_Surface (data flow) =
 ["Land" | "Sea"].
Earth_Velocity_Components (data flow) =
 Latitude_Velocity +
 Longitude_Velocity +
 Altitude_Velocity.
Elevation (data flow) =
 Radians.
Engine_Smoke (data flow) =
 "Boolean".
Entity_Damage (data flow) =
 ["Nose_High_Starboard" + "Nose_Low_Starboard" +
 "Nose_High_Port" + "Nose_Low_Port" +
 "Fuselage_High_Starboard" + "Fuselage_Low_Starboard" +
 "Fuselage_High_Port" + "Fuselage_Low_Port" +
 "Tail_High_Starboard" + "Tail_Low_Starboard" +
 "Tail_High_Port" + "Tail_Low_Port" +
 "Main_Rotor" + "Tail_Rotor" + "Landing_Gear"].
Entity_Damage_Data (data flow) =
 Damage_Location + Damage_Severity.
Entity_Kind_List (data flow) =
 ["Other" | "Platform" | "Munition" | "Life_Form" |
 "Environmental" | "Cultural_Feature"].
Entity_Marking (data flow) =
 Character_Set + Text.
Entity_Type (data flow) =
 Kind + Domain + Country + Category +
 Subcategory + Specific + Extra.
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Environment_Adjustment (data flow) =
 Environment_ID + Intensity.
Environment_Effects_Control (data flow) =
 "Environment_Effects_Control".
Environment_Effects_Directives (data flow) =
 "Environment_Effects_Directives".
Environment_Effects_Stat (data flow) =
 "Environment_Effects_Stat".
Environment_ID (data flow) =
 Environmental_Set.
Environmental_Adjustment_Message (data flow) =
 Environment_Adjustment.
Environmental_Set (data flow) =
 ["Clouds" | "Scud"].
Equations_Of_Motion_Max_Rate (data flow) =
 Ownship_Linear_Velocity +
 Ownship_Angular_Acceleration +
 Ownship_Angular_Position +
 Ownship_Angular_Velocity +
 Ownship_Attitude_Relative_To_Deck +
 Ownship_Earth_Axis_Acceleration +
 Ownship_Earth_Axis_Position +
 Ownship_Earth_Axis_Velocity +
 Ownship_Linear_Acceleration +
 Ownship_Linear_Velocity +
 Flight_Parameters_Wind_Axis.
Equations_Of_Motion_Max_Rate_Outputs (data flow) =
 Equations_Of_Motion_Max_Rate.
External_Detonation_Outputs (data flow) =
 Detonation_Data.
External_Entities_Height_Above_Terrain (data flow) =
 External_Entity_Terrain_Data.
External_Entities_Height_Above_Terrain_Max_Rate (data flow) =
 External_Entities_Height_Above_Terrain.
External_Entities_Height_Above_Terrain_Max_Rate_Outputs (data flow) =
 External_Entities_Height_Above_Terrain_Max_Rate.
External_Entity (data flow) =
 External_Entity_ID.
External_Entity_Count (data flow) =
 "Integer".
External_Entity_Data_Update_Rate_Change (data flow) =
 External_Entity_Data_Update_Rate_Change_Request.
External_Entity_Data_Update_Rate_Change_Request (data flow) =
 ID + Update_Rate.
External_Entity_Deactivation (data flow) =
 ID + External_Entity_State.
```

External_Entity_Dynamic_Data (data flow) =
ID + Position + Velocity + Acceleration +
Attitude + Angular_Velocity +
Angular_Acceleration + Downwash_Angle +
Articulation.
External_Entity_Dynamic_Data_Array (data flow) =
{External_Entity_Dynamic_Data}.
External_Entity_Dynamic_Data_Element (data flow) =
External_Entity_Dynamic_Data_Array.
External_Entity_Dynamic_Data_Record (data flow) =
Number_Of_Entities_In_Array +
Dynamic_Data.
External_Entity_ID (data flow) =
Unique_Number.
External_Entity_State (data flow) =
"Boolean".
External_Entity_Static_Data (data flow) =
ID + Static_Type + Marking.
External_Entity_Static_Data_Array (data flow) =
{External_Entity_Static_Data}.
External_Entity_Static_Data_Element (data flow) =
External_Entity_Static_Data_Array.
External_Entity_Terrain_Data (data flow) =
Number_Of_Elements_In_Array +
External_Entity_Terrain_Heights.
External_Entity_Terrain_Height (data flow) =
External_Entity + Height_Above_Terrain.
External_Entity_Terrain_Height_Array (data flow) =
{External_Entity_Terrain_Height}.
External_Entity_Terrain_Heights (data flow) =
External_Entity_Terrain_Height_Array.
External_Fire_Outputs (data flow) =
Fire_Data.
Extra (data flow) =
"Integer".
FDDI_Global_Bus_To_VSC (data flow) =
Equations_Of_Motion_Max_Rate_Outputs +
Time_Of_Year_Message +
Ownship_Chaff_And_Flares_Half_Rate_Outputs +
Ownship_Chaff_And_Flares_Sixteenth_Rate_Outputs +
Clock_Tick_Message_Max_Rate +
Mode_Selection_Command +
On_Line_Diagnostic_Command +
Remote_Controlled_Diagnostic_Command +
Simulator_Control_Discrete_Message +
State_Selection_Command +

Time_Change_Message +
Ownship_Position_Change_Demand +
Weapon_Load_Set_Message +
Training_Area_Boundary_Message +
Parameter_Change_Message +
Environmental_Adjustment_Message +
Lightning_Adjustment_Message +
Thunderstorm_Dynamic_Data_Message +
Cloud_Level_Adjustment_Message +
Visual_Model_Database_Message +
Visual_Range_Adjustment_Message +
Visual_Eyepoint_Active +
Touchdown_Message +
Flight_Station_To_Visual_Discrete_Change +
Visual_AI_Max_Rate_Outputs +
External_Entity_Data_Update_Rate_Change +
Mission_Computer_Interface_Half_Rate_Outputs +
Sensor_Pointing_And_Dynamics_Max_Rate_Output +
Ownship_Height_Above_Terrain_Max_Rate_Outputs +
Collision_Data_Change +
External_Entities_Height_Above_Terrain_Max_Rate_Outputs +
External_Fire_Outputs +
Unguided_Weapon_Dynamics_Half_Rate_Outputs +
External_Detonation_Outputs +
Air_Vehicle_Dynamics_Half_Rate_Outputs +
Ground_Vehicle_Dynamics_Half_Rate_Outputs +
Air_Vehicle_Static_Outputs +
Ground_Vehicle_Static_Outputs +
Guided_Weapon_Dynamics_Half_Rate_Outputs +
Chaff_Dynamics_Half_Rate_Outputs +
Flare_Dynamics_Half_Rate_Outputs +
Ownship_Damage_Occurrence +
Ownship_Weapon_Fire_Occurrence +
Ownship_Weapon_Dynamics_Half_Rate_Outputs +
Weapon_Deactivation.

Feet (data flow) =
"Float".

Fire_Data (data flow) =
Burst + Location.

Fire_Data_Location (data flow) =
Earth_Position_Components.

Flaming (data flow) =
"Boolean".

Flare_Brightness (data flow) =
Lumens.

Flare_Count (data flow) =

"Integer".
Flare_Data (data flow) =
Flare_External_Entity_Unique_Data_Array.
Flare_Dynamics_Half_Rate (data flow) =
External_Entity_Dynamic_Data_Element.
Flare_Dynamics_Half_Rate_Outputs (data flow) =
Flare_Dynamics_Half_Rate.
Flare_External_Entity_Unique_Data (data flow) =
ID + Flare_Brightness + Flare_Radius.
Flare_External_Entity_Unique_Data_Array (data flow) =
{Flare_External_Entity_Unique_Data}.
Flare_External_Entity_Unique_Data_Record (data flow) =
Number_Of_Flares_In_Array +
Flare_Data.
Flare_Radius (data flow) =
Feet.
Flares_Unique_Data (data flow) =
Flare_External_Entity_Unique_Data_Record.
Flight_Parameters_Wind_Axis (data flow) =
Angular_Position_Components.
Flight_Station_To_Visual_Discrete_Change (data flow) =
Visual_Discrete_Data.
FLIR_Polarity (data flow) =
FLIR_Polarity_Types.
FLIR_Polarity_Types (data flow) =
["Black_Hot" | "White_Hot"].
Frame_Numbers (data flow) =
"Integer".
Ft_Per_Min (data flow) =
"Float".
Fuze (data flow) =
Munitions_Fuze_List.
General_Stat (data flow) =
"General_Stat".
Ground_Vehicle_Appearance (data flow) =
Ground_Vehicle_Appearance_Array.
Ground_Vehicle_Appearance_Array (data flow) =
{Platform_Land_Domain_Entity_Appearance}.
Ground_Vehicle_Dyanamics_Half_Rate (data flow) =
External_Entity_Dynamic_Data_Element +
Ground_Vehicle_Appearance.
Ground_Vehicle_Dynamics_Half_Rate_Outputs (data flow) =
Ground_Vehicle_Dyanamics_Half_Rate.
Ground_Vehicle_Static_Data (data flow) =
External_Entity_Static_Data_Element.
Ground_Vehicle_Static_Outputs (data flow) =

Ground_Vehicle_Static_Data.
Guided_Weapon_Appearance (data flow) =
Guided_Weapon_Appearance_Array.
Guided_Weapon_Appearance_Array (data flow) =
{Munitions_Entity_Appearance}.
Guided_Weapon_Dynamics_Half_Rate (data flow) =
External_Entity_Dynamic_Data_Element +
Guided_Weapon_Appearance.
Guided_Weapon_Dynamics_Half_Rate_Outputs (data flow) =
Guided_Weapon_Dynamics_Half_Rate.
Hardware_Description_Data (data flow) =
CIG_Description_Data.
Hardware_Interface_Control (data flow) =
HT_Control +
Joystick_Control +
HMD_Control +
CIG_Control +
OTW_Control.
Hardware_Interface_Data (data flow) =
Predicted_Head_Position +
Joystick_HW_Data.
Hardware_Stat (data flow) =
HT_HW_Stat +
Joystick_HW_Stat +
HMD_HW_Stat +
CIG_HW_Stat +
OTW_HW_Stat.
Hatch (data flow) =
"Integer".
Height_Above_Terrain (data flow) =
Feet.
HMD_Control (data flow) =
"HMD_Control".
HMD_Directives (data flow) =
"HMD_Directives".
HMD_HW_Stat (data flow) =
"HMD_HW_Stat".
HMD_Stat (data flow) =
"HMD_Stat".
HMD_To_VSC (data flow) =
"HMD_To_VSC".
Hours (data flow) =
"Integer".
HT_Control (data flow) =
"HT_Control".
HT_Data (data flow) =

"HT_Data".
HT_Directives (data flow) =
"HT_Directives".
HT_HW_Stat (data flow) =
"HT_HW_Stat".
HT_Stat (data flow) =
"HT_Stat".
HT_To_VSC (data flow) =
"HT_To_VSC".
ID (data flow) =
External_Entity_ID.
Initial_Scene_Content_Directives (data flow) =
"Initial_Scene_Content_Directives".
Instuctor_Controllable_Parameter (data flow) =
"Instructor_Controllable_Parameter".
Intended_Target (data flow) =
External_Entity_ID.
Intensity (data flow) =
Intensity_Adjustment.
Intensity_Adjustment (data flow) =
"Integer".
Joystick_Control (data flow) =
"Joystick_Control".
Joystick_Directives (data flow) =
"Joystick_Directives".
Joystick_HW_Data (data flow) =
"Joystick_HW_Data".
Joystick_HW_Stat (data flow) =
"Joystick_HW_Stat".
Joystick_Stat (data flow) =
"Joystick_Stat".
Joystick_To_VSC (data flow) =
"Joystick_To_VSC".
Kind (data flow) =
Entity_Kind_List.
Lat_Long_Location (data flow) =
Latitude + Longitude.
Lateral_Acceleration (data flow) =
"Float".
Lateral_Position (data flow) =
Feet.
Lateral_Velocity (data flow) =
"Float".
Latitude (data flow) =
Radians.
Latitude_Acceleration (data flow) =

"Float".
Latitude_Position (data flow) =
Radians.
Latitude_Velocity (data flow) =
"Float".
Launch_Flash (data flow) =
"Boolean".
Launcher (data flow) =
"Boolean".
Letter (data flow) =
"Character".
Lighting_Adjustment (data flow) =
Lighting_Element + Intensity.
Lighting_Adjustment_Message (data flow) =
Lighting_Adjustment.
Lighting_Element (data flow) =
Adjustable_Lighting.
Linear_Acceleration_Components (data flow) =
Longitudinal_Acceleration +
Lateral_Acceleration +
Vertical_Acceleration.
Linear_Position_Components (data flow) =
Longitudinal_Position + Lateral_Position +
Vertical_Position.
Linear_Velocity_Components (data flow) =
Longitudinal_Velocity +
Lateral_Velocity +
Vertical_Velocity.
Loc_Entity (data flow) =
Linear_Position_Components.
Location (data flow) =
Fire_Data_Location.
Location_Estimate_And_Flight_Regime (data flow) =
Air_To_Air_Target_Data.
Longitude (data flow) =
Radians.
Longitude_Acceleration (data flow) =
"Float".
Longitude_Position (data flow) =
Radians.
Longitude_Velocity (data flow) =
"Float".
Longitudinal_Acceleration (data flow) =
"Float".
Longitudinal_Position (data flow) =
Feet.

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Longitudinal_Velocity (data flow) =
 "Float".
Lumens (data flow) =
 "Float".
Marking (data flow) =
 Entity_Marking.
MHZ (data flow) =
 "Float".
Minutes (data flow) =
 "Integer".
Mission_Computer_Interface_Half_Rate (data flow) =
 Location_Estimate_And_Flight_Regime.
Mission_Computer_Interface_Half_Rate_Outputs (data flow) =
 Mission_Computer_Interface_Half_Rate.
MM_Control (data flow) =
 "MM_Control".
MM_Stat (data flow) =
 "MM_Stat".
Mode_Selection_Command (data flow) =
 Mode_Selection_Commands.
Mode_Selection_Commands (data flow) =
 Modules_Affected + Control_Command.
Mode_Selection_Replies (data flow) =
 Control_Reply +
 Responding_Module.
Module_Mode_Change_Commands (data flow) =
 ["Device" | "System" | "Remote_Controlled_Diagnostic" |
 "Simulation" | "Shutdown"].
Module_Mode_Change_Responses (data flow) =
 ["Device" | "System" | "Remote_Controlled_Diagnostic" |
 "Simulation" | "Shutdown"].
Module_Names (data flow) =
 ["Simulator_System" | "Visual" | "Flight_Station"].
Module_Selection_Array (data flow) =
 {Selection_Status}.
Modules_Affected (data flow) =
 Module_Selection_Array.
Month (data flow) =
 "Integer".
Moving_Model_Directives (data flow) =
 "Moving_Model_Directives".
Munition (data flow) =
 Entity_Type.
Munitions_Entity_Appearance (data flow) =
 Launch_Flash + Rocket_Flame + Other.
Munitions_Fuze_List (data flow) =
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 ["Other" | "Contact" | "Contact_Instant" |
 "Contact_Delayed" | "Timed" | "Proximity" |
 "Command" | "Altitude" | "Depth" | "Acoustic"].
Munitions_Warhead_List (data flow) =
 ["Other" | "High_Explosive" |
 "High_Explosive_Plastic" | "High_Explosive_Incendiary" |
 "High_Explosive_Fragmentation" |
 "High_Explosive_Anti_Tank" |
 "High_Explosive_Bomblets" |
 "High_Explosive_Shaped_Charge" | "Smoke" |
 "Illumination" | "Practice" | "Kinetic" |
 "Unused" | "Nuclear" | "Chemical_General" |
 "Chemical_Blister_Agent" | "Chemical_Blood_Agent" |
 "Chemical_Nerve_Agent" | "Biological_General"].
N_E_Corner (data flow) =
 Lat_Long_Location.
N_W_Corner (data flow) =
 Lat_Long_Location.
Name (data flow) =
 Visual_DI.
Nautical_Miles (data flow) =
 "Float".
Net_Interface_Control (data flow) =
 "Net_Interface_Control".
Net_Interface_Data (data flow) =
 "Net_Interface_Data".
New_Time (data flow) =
 Time.
Number_Of_Active_Discretes (data flow) =
 Visual_Discrete_Count.
Number_Of_Chaffs_In_Array (data flow) =
 Chaff_Count.
Number_Of_Elements_In_Array (data flow) =
 External_Entity_Count.
Number_Of_Entities_In_Array (data flow) =
 External_Entity_Count.
Number_Of_Flares_In_Array (data flow) =
 Flare_Count.
On_Line_Diagnostic_Command (data flow) =
 On_Line_Diagnostic_Commands.
On_Line_Diagnostic_Commands (data flow) =
 Segments_Affected +
 On_Line_Diagnostics_Requested +
 Response_Rate.
On_Line_Diagnostic_Replies (data flow) =
 Responding_Segment +
```

On_Line_Diagnostic_Result.
On_Line_Diagnostic_Report_Array (data flow) =
{["Critical_Failure" | "Non_Critical_Failure" |
"No_Failure" | "Not_Running"]}.
On_Line_Diagnostic_Result (data flow) =
On_Line_Diagnostic_Report_Array.
On_Line_Diagnostics_Array (data flow) =
{Selection_Status}.
On_Line_Diagnostics_Requested (data flow) =
On_Line_Diagnostics_Array.
Other (data flow) =
"Integer".
OTW_Control (data flow) =
"OTW_Control".
OTW_Directives (data flow) =
"OTW_Directives".
OTW_Displays_To_VSC (data flow) =
"OTW_Displays_To_VSC".
OTW_HW_Stat (data flow) =
"OTW_HW_Stat".
OTW_Stat (data flow) =
"OTW_Stat".
Ownship_Angular_Acceleration (data flow) =
Angular_Acceleration_Components.
Ownship_Angular_Position (data flow) =
Angular_Position_Components.
Ownship_Angular_Velocity (data flow) =
Angular_Velocity_Components.
Ownship_Attitude_Relative_To_Deck (data flow) =
Angular_Position_Components.
Ownship_Chaff_And_Flares_Half_Rate_Outputs (data flow) =
Chaff_And_Flares_Half_Rate.
Ownship_Chaff_And_Flares_Sixteenth_Rate_Outputs (data flow) =
Chaff_And_Flares_Sixteenth_Rate.
Ownship_Control (data flow) =
"Ownship_Control".
Ownship_Damage_Occurrence (data flow) =
Entity_Damage_Data.
Ownship_Directives (data flow) =
"Ownship_Directives".
Ownship_Earth_Axis_Acceleration (data flow) =
Earth_Acceleration_Components.
Ownship_Earth_Axis_Position (data flow) =
Earth_Position_Components.
Ownship_Earth_Axis_Velocity (data flow) =
Earth_Velocity_Components.

Ownship_Height_Above_Terrain (data flow) =
Feet.
Ownship_Height_Above_Terrain_Max_Rate (data flow) =
Ownship_Height_Above_Terrain +
Ownship_Over_Land_Or_Sea.
Ownship_Height_Above_Terrain_Max_Rate_Outputs (data flow) =
Ownship_Height_Above_Terrain_Max_Rate.
Ownship_Linear_Acceleration (data flow) =
Linear_Acceleration_Components.
Ownship_Linear_Velocity (data flow) =
Linear_Velocity_Components.
Ownship_Over_Land_Or_Sea (data flow) =
Earth_Surface.
Ownship_Position_Change_Demand (data flow) =
Earth_Position_Components.
Ownship_Stat (data flow) =
"Ownship_Stat".
Ownship_Weapon_Dynamics_Half_Rate (data flow) =
Ownship_Weapons_Dynamic_Data.
Ownship_Weapon_Dynamics_Half_Rate_Outputs (data flow) =
Ownship_Weapon_Dynamics_Half_Rate.
Ownship_Weapon_Fire_Occurrence (data flow) =
Ownship_Weapon_Fire_Status.
Ownship_Weapon_Fire_Status (data flow) =
Station_Fired_From + Weapon_Fired + Intended_Target.
Ownship_Weapons_Dynamic_Data (data flow) =
External_Entity_Dynamic_Data_Record.
Paint_Scheme (data flow) =
"Integer".
Parameter_Change_Message (data flow) =
Parameter_Change_Request.
Parameter_Change_Request (data flow) =
Control_Parameter + Value_Requested.
Part (data flow) =
Articulated_Part.
Part_Position (data flow) =
Radians.
Pitch_Acceleration (data flow) =
"Float".
Pitch_Angle (data flow) =
Radians.
Pitch_Velocity (data flow) =
"Float".
Platform_Air_Domain_Entity_Appearance (data flow) =
Destroyed + Flaming + After_Burner +
Running_Lights + Speed_Brake + Damage_Location_1 +

Damage_Location_2 + Damage_Severity + Other.
Platform_Land_Domain_Entity_Appearance (data flow) =
Destroyed + Smoke_Plume + Flaming + Dust_Cloud +
Paint_Scheme + Launcher + Engine_Smoke +
Hatch + Other.
Polar_Direction (data flow) =
Azimuth + Elevation.
Position (data flow) =
Earth_Position_Components.
Pounds (data flow) =
"Float".
Predicted_Head_Position (data flow) =
"Predicted_Head_Position".
Quantity (data flow) =
"Integer".
Radians (data flow) =
"Float".
Range_Set (data flow) =
Nautical_Miles.
Remote_Controlled_Diagnostic_Command (data flow) =
Remote_Controlled_Diagnostic_Commands.
Remote_Controlled_Diagnostic_Commands (data flow) =
Segments_Affected +
Remote_Controlled_Diagnostics_Requested +
Activity_Requested.
Remote_Controlled_Diagnostic_Replies (data flow) =
Responding_Segment +
Remote_Controlled_Diagnostics_State +
Remote_Controlled_Diagnostics_Name +
Remote_Controlled_Diagnostics_Result.
Remote_Controlled_Diagnostics (data flow) =
"Remote_Controlled_Diagnostics".
Remote_Controlled_Diagnostics_Name (data flow) =
Remote_Controlled_Diagnostics.
Remote_Controlled_Diagnostics_Requested (data flow) =
Remote_Controlled_Diagnostics.
Remote_Controlled_Diagnostics_Result (data flow) =
Test_Result.
Remote_Controlled_Diagnostics_State (data flow) =
Task_Reply.
Responding_Module (data flow) =
Module_Names.
Responding_Segment (data flow) =
Segment_Names.
Response_Rate (data flow) =
Minutes.

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Results (data flow) =
 Detonation_Result.
Rocket_Flame (data flow) =
 "Boolean".
Roll_Acceleration (data flow) =
 "Float".
Roll_Angle (data flow) =
 Radians.
Roll_Velocity (data flow) =
 "Float".
Running_Lights (data flow) =
 "Boolean".
S_E_Corner (data flow) =
 Lat_Long_Location.
S_W_Corner (data flow) =
 Lat_Long_Location.
Scene_Content_Stat (data flow) =
 "Scene_Content_Stat".
Seconds (data flow) =
 "Integer".
Segment_Names (data flow) =
 ["Aircraft_Survivability_Equipment" |
 "Control" | "Flight_Controls" | "Flight_Dynamics" |
 "Flight_Station" | "Navigation_Communication" |
 "Physical_Cues" | "Propulsion" | "Sensors" |
 "Tactical_And_Natural_Environments" | "Visual" |
 "Weapons"] .
Segment_Selection_Array (data flow) =
 {Selection_Status}.
Segments_Affected (data flow) =
 Segment_Selection_Array.
Selection_Status (data flow) =
 ["On" | "Off"].
Sensor_Field_Of_Regard (data flow) =
 Radians.
Sensor_Field_Of_View (data flow) =
 ["Wide" | "Narrow" | "Very_Narrow" | "Composite"].
Sensor_FOV (data flow) =
 Sensor_Field_Of_View.
Sensor_Image_Type (data flow) =
 ["Forward_Looking_Infrared" |
 "Thermal_Image_Sensor" |
 "Day_Television" |
 "Gray_Scale" |
 "Blank" |
 "Image_Intensifier" |
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 "NVPS"].
Sensor_Line_Of_Sight (data flow) =
 Polar_Direction.
Sensor_Mode (data flow) =
 Sensor_Image_Type.
Sensor_Pointing_And_Dynamics_Data (data flow) =
 Sensor_Pointing_Data_Array.
Sensor_Pointing_And_Dynamics_Max_Rate (data flow) =
 Sensor_Pointing_And_Dynamics_Data.
Sensor_Pointing_And_Dynamics_Max_Rate_Output (data flow) =
 Sensor_Pointing_And_Dynamics_Max_Rate.
Sensor_Pointing_Data (data flow) =
 Sensor_Mode +
 Sensor_FOV +
 Sensor_Line_Of_Sight +
 FLIR_Polarity +
 Sensor_Field_Of_Regard.
Sensor_Pointing_Data_Array (data flow) =
 {Sensor_Pointing_Data}.
Simulation_Frames (data flow) =
 Frame_Numbers.
Simulator_Control_Discrete_Message (data flow) =
 Simulator_Control_Discrete_State.
Simulator_Control_Discrete_State (data flow) =
 ["Off" | "On"].
Smoke_Plume (data flow) =
 "Boolean".
Special_Effects_Control (data flow) =
 "Special_Effects_Control".
Special_Effects_Directives (data flow) =
 "Special_Effects_Directives".
Special_Effects_Stat (data flow) =
 "Special_Effects_Stat".
Specific (data flow) =
 "Integer".
Speed_Brake (data flow) =
 "Boolean".
State (data flow) =
 Touchdown_State.
State_Selection_Command (data flow) =
 State_Selection_Commands.
State_Selection_Commands (data flow) =
 Segments_Affected + Control_Command.
State_Selection_Replies (data flow) =
 Responding_Segment +
 Control_Reply.
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Static_Type (data flow) =
 Entity_Type.
Station (data flow) =
 Stores_Station.
Station_Fired_From (data flow) =
 Stores_Station.
Station_Weapon_Load (data flow) =
 ["Hellfire_Launcher" | "Tube_Rocket_Launcher" |
 "External_Fuel_Tank" | "Empty"].
Status (data flow) =
 Discrete_State.
Stores_Station (data flow) =
 ["Left_Wing_Outboard" | "Left_Wing_Inboard" |
 "Right_Wing_Inboard" | "Right_Wing_Outboard"].
Subcategory (data flow) =
 "Integer".
Task_Command (data flow) =
 ["Initialize_Task" | "Execute_Task" | "Hold_Task" |
 "Resume_Task" | "Abort_Task"].
Task_Reply (data flow) =
 ["Initialized" | "Executing" | "On_Hold" |
  esumed" | "Aborted" | "Completed"].
    _Result (data flow) =
 Running" | "Passed" | "Failed"].
Text (data flow) =
 {Letter}.
Thunderstorm_Dynamic_Data_Message (data flow) =
 External_Entity_Dynamic_Data.
Time (data flow) =
 Hours + Minutes + Seconds.
Time_Change_Message (data flow) =
 Time_Request.
Time_Name (data flow) =
 Time_Parameter.
Time_Of_Year_Message (data flow) =
 Year_Time.
Time_Parameter (data flow) =
 ["Time_Of_Day" | "Mission_Clock" |
 "Mission_Elapsed_Time" | "Greenwich_Mean_Time"].
Time_Request (data flow) =
 Time_Name + New_Time.
Touchdown_Data (data flow) =
 Location + State.
Touchdown_Location (data flow) =
 ["Left_Skid" | "Right_Skid" | "Tail_Skid" |
 "Chin_Turret" | "Left_Rotor_Tip" |
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"Right_Rotor_Tip" | "Forward_Rotor_Tip"].
Touchdown_Message (data flow) =
Touchdown_Data.
Touchdown_State (data flow) =
["In_Air" | "On_Ground" | "On_Sea"].
Training_Area_Boundaries (data flow) =
N_W_Corner +
N_E_Corner +
S_W_Corner +
S_E_Corner.
Training_Area_Boundary_Message (data flow) =
Training_Area_Boundaries.
Uncorrected_Head_Position (data flow) =
"Uncorrected_Head_Position".
Unguided_Weapon_Dynamics_Half_Rate (data flow) =
External_Entity_Dynamic_Data_Element.
Unguided_Weapon_Dynamics_Half_Rate_Outputs (data flow) =
Unguided_Weapon_Dynamics_Half_Rate.
Unique_Number (data flow) =
"Integer".
Update_Rate (data flow) =
Data_Update_Rate.
User_Interface_Control (data flow) =
"User_Interface_Control".
User_Interface_Data (data flow) =
"User_Interface_Data".
Value_Requested (data flow) =
"Float".
Velocity (data flow) =
Earth_Velocity_Components.
Vertical_Acceleration (data flow) =
"Float".
Vertical_Position (data flow) =
Feet.
Vertical_Velocity (data flow) =
"Float".
Visual_AI_Max_Rate (data flow) =
"Visual_AI_Max_Rate".
Visual_AI_Max_Rate_Outputs (data flow) =
Visual_AI_Max_Rate.
Visual_Channel_Control (data flow) =
"Visual_Channel_Control".
Visual_Channel_Directives (data flow) =
"Visual_Channel_Directives".
Visual_Channel_Stat (data flow) =
"Visual_Channel_Stat".

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Visual_DI (data flow) =
 "Visual_DI".
Visual_Discrete_Count (data flow) =
 "Integer".
Visual_Discrete_Data (data flow) =
 Number_Of_Active_Discretes +
 Visual_Dynamic_Data.
Visual_Discrete_Data_Change (data flow) =
 Visual_Discrete_Data.
Visual_Discrete_Data_Pair (data flow) =
 Name +
 Status.
Visual_Discrete_Data_Pair_Array (data flow) =
 {Visual_Discrete_Data_Pair}.
Visual_Dynamic_Data (data flow) =
 Visual_Discrete_Data_Pair_Array.
Visual_Eyepoint (data flow) =
 ["Pilot" | "Copilot_Observer"].
Visual_Eyepoint_Active (data flow) =
 Visual_Eyepoint.
Visual_Mode_Selection_Reply (data flow) =
 Mode_Selection_Replies.
Visual_Model_Database (data flow) =
 ["Default_Model"].
Visual_Model_Database_Message (data flow) =
 Visual_Model_Database.
Visual_On_Line_Diagnostic_Reply (data flow) =
 On_Line_Diagnostic_Replies.
Visual_Range (data flow) =
 ["Maximum_Range" | "General_Visibility"].
Visual_Range_Adjustment (data flow) =
 Visual_Range_ID + Range_Set.
Visual_Range_Adjustment_Message (data flow) =
 Visual_Range_Adjustment.
Visual_Range_ID (data flow) =
 Visual_Range.
Visual_Remote_Controlled_Diagnostic_Reply (data flow) =
 Remote_Controlled_Diagnostic_Replies.
Visual_State_Selection_Reply (data flow) =
 State_Selection_Replies.
VSC_To_CIG (data flow) =
 "VSC_To_CIG".
VSC_To_Console (data flow) =
 "VSC_To_Console".
VSC_To_FDDI_Global_Bus (data flow) =
 Visual_Mode_Selection_Reply +
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Visual_On_Line_Diagnostic_Reply +
Visual_Remote_Controlled_Diagnostic_Reply +
Visual_State_Selection_Reply +
Visual_Discrete_Data_Change.
VSC_To_HMD (data flow) =
"VSC_To_HMD".
VSC_To_HT (data flow) =
"VSC_To_HT".
VSC_To_Joystick (data flow) =
"VSC_To_Joystick".
VSC_To_OTW_Displays (data flow) =
"VSC_To_OTW_Displays".
VSM_Protocol_Language (data flow) =
"VSM_Protocol_Language".
Warhead (data flow) =
Munitions_Warhead_List.
Weapon (data flow) =
Station_Weapon_Load.
Weapon_Deactivation (data flow) =
External_Entity_Deactivation.
Weapon_Fired (data flow) =
External_Entity_ID.
Weapon_Load_Set (data flow) =
ID + Desired_Load.
Weapon_Load_Set_Message (data flow) =
Weapon_Load_Set.
Weapon_Station_Loading (data flow) =
Station + Weapon + Quantity + Weapon_Station_Status.
Weapon_Station_Status (data flow) =
["Empty" | "Release" | "Load" | "Hung" | "Jettison"].
Yaw_Acceleration (data flow) =
"Float".
Yaw_Angle (data flow) =
Radians.
Yaw_Velocity (data flow) =
"Float".
Year (data flow) =
"Integer".
Year_Time (data flow) =
Day + Month + Year.